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Description

METHOD OF WINCHING CUT TIMBER IN A FOREST AND A MACHINE DESIGNED TO ACCOMPLISH THIS

BACKGROUND OF INVENTION

[0001] When trees are felled in forest harvesting, the felled trunks need to be retrieved. Many of the methods currently used cause a great deal of environmental damage and are not environmentally friendly. The following are current methods used to retrieve felled tree trunks:

[0002] a) Using heavy vehicles to skid the log over distances to the log collection point. This causes damage to the ground as well as damage to the log. The log's damage in this manner will affect its recovery of good quality timber.

[0003] b) Bringing in heavy vehicles such as crawler tractors to the site of the felled tree. This will cause damage to the surrounding area of the felled tree, including damage in making a pathway into the jungle for the crawler tractors

to reach the felled tree. Growing saplings, and young trees are usually pushed over and destroyed in this method. Up to 60% of the harvesting area can be partially cleared and damaged in this process.

[0004] c) Helicopter lifting of logs. However this is costly and usually not cost efficient.

[0005] d) In Patent no GB2359001A, the design of a harvester has a long extended boom which will hoist the cut log over the air to the collection point. While this uses the principal of a cable and rises over the tree top thus saving the need to bring in heavy equipment to the felled tree, the limitation of this design is the length of the boom of the harvester. This is additionally, a constraint on the availability of large open spaces that would be required for efficient operation of the harvester, taking into consideration its large boom length.

[0006] Moreover, when the boom is too long, in excess of 60m, the counterweight required on the harvester to balance the weight of the winched log would be required. A greater counterweight would require bigger harvesters and incur more costs.

[0007] Bigger harvesters are also more cumbersome to deploy and relocate when required. The stability of the harvester

with very long booms are at question, and its overall effectiveness, while good at smaller ranges, is limited by its boom length.

[0008] Hilly undulating terrain with steep slopes also present a problem for the use of the design of patent no. GB2359001A, as the harvester therein is bulky and relocation is cumbersome. Also hilly undulating terrain presents problems and potential obstacles and range problems for the harvester with its long boom when it needs to be poised and positioned for effective hauling of logs.

[0009] When logging is taking place in tropical forest or where trees are very large, which can be 35m to 55m in height, and weigh around 2.5 to 4 tonnes, many other types of harvesters designed or available in the market are not made for such conditions. Such as (Bruun (1978) US4114666), (Sundberg et alPat. (2002) US2002/0060199), (Kessler etalPat. .(1974) US3805,859), (Gaudreault et al (2000), US6,135,175)

[0010] This present invention addresses the problem of retrieving large sized timber under steep terrain situations which pose a limitation to conventional logging techniques.

Brief Description of Drawings

[0011] The following are the names of the parts in drawings of Figures 1 to 5

[0012] FIGURE 1

[0013] The 'Logfisher' harvester

[0014] 1-Pully

[0015] 2-Boom Arm

[0016] 3-Winch Cable Reel

[0017] 4- Engine part of harveter

[0018] 5-Excavator Tracks

[0019] 6-Operator's Cabin

[0020] 7-Forward Chain Carrier

[0021] 8-Grappler Claws

[0022] 9-Bucket

[0023] 10-Winching Cable

[0024] 11-Backhoe fore-arm in Stabilizing position

[0025] 12-Hydraulic Cylinders to control the arm movements.

[0026] FIGURE 2

[0027] The Boom Arm

[0028] 13-Reel

[0029] 14-Winching Cable

[0030] 15-Boom

[0031] 16-Pulley System

[0032] 17-Backhoe 'forearm'

[0033] 18-Bucket Hydraulic Cylinder

[0034] 19-Bucket

[0035] 20-Grapple Claw Hydraulic Cylinder

[0036] 21- 'Fore-arm' Hydraulic Cylinder

[0037] 22-Grapple Claw

[0038] 23-Solenoid Valve

[0039] FIGURE 3

[0040] A figure of the winch reel at the end of the boom, and on top of the harvester body

[0041] 24-WInching Cable

[0042] 25-Cable Reel

[0043] 26-Reel Mounting

[0044] 27-Top of Operator's Cabin

[0045] 28-Boom Arm Hydraulic Cylinder

[0046] 29-Boom Arm

[0047] FIGURE 4

[0048] Logfisher in position at the Landing Bay, ready to conduct winching operation up a slope (see diagrammatic illustration)

[0049] 30-Winching Cable being extended down to the felled log.

[0050] 31-Backhoe fore-arm with bucket in stabilizing position giving the harvester additional stability.

[0051] 32-Logfisher Harvester in a stable position at loading bay area.

[0052] 33-Depth of vertical distance from logfisher harvester to the cut timber is up to 1.5km (1500 meters).

[0053] 34-Horizontal Distance from Logfisher harvester to filled timber is up to 400 meters.

[0054] 35-The fastening of the S-Ring, hook or similar noosing device.

[0055] 36-Choker cable or chain to ring round the log and secure it.

[0056] 37-The log which is to be winched up to the loading bay.

[0057] Figure 5

[0058] This is a diagrammatic representation showing the position of the solenoid valve.

[0059] Figure 5-1 The diagrammatic representation before the inclusion of the solenoid valve.

[0060] Figure 5-2 The diagrammatic representation after the inclusion of the solenoid valve.

[0061] 38-Hydraulic Pressure Pump

[0062] 39-Centre Joint

[0063] 40-Left Track Motor

[0064] 41-Right Track Motor

[0065] 42-Metal Pipes through which hydraulic fluid travels from the engine to power the reel.

[0066] 43-Winching Cable Reel.

[0067] 44-Solenoid Valve which enhances the power of the hydraulics to power the winch and through which the hydraulic fluid travels.

DETAILED DESCRIPTION

[0068] OBJECTIVE OF THE INVENTION

[0069] The purpose of this invention is to demonstrate a log winching machine whose effectiveness and function is not limited by the length of the boom, while being very stable

due to the stabilizing arm, thereby requiring minimal intrusion and damage to the forest during forest harvesting, and therefore enabling commercial logging operations to take place while keeping to Forestry Preservation Principles set out by the Forestry Steward Council.

[0070] SUMMARY OF THE INVENTION

[0071] A method of retrieving cut logs in a forest, by a method of hauling, using a machine (FIGURE 1), being of an excavator body (4) (5) (6) , with a modified backhoe bottom arm portion (2) that adapts to function as a boom (2) , that has a winch pulley (1) at one end and a hydraulically powered reel (3) at the other, with this hydraulically powered reel (3) strategically fitted above the excavator to optimize turning effect, and with an appendage backhoe 'fore-arm' (11) fitted under the backhoe bottom arm portion to support the boom, providing leverage and stability to the excavator in the process of winching, therefore enabling greater efficiency and overall productivity of the machine and logging operation as a whole, which has not been able to be attained by other methods previously known.

[0072] A description of the method of log retrieval is as follows (see FIGURE 4, and Brief Description of Drawings on FIGURE 4).

[0073] The design of this invention is termed as the 'Logfisher'.

[0074] 1. POSITIONING

[0075] 1.1 In order to determine the ideal position of the Logfisher, a supervisor and his assistant moves down into the area to locate the felled logs and to study the best alignment for winching the logs and to position the Logfisher. The Supervisor then moves back to the feeder road to direct the Logfisher to its intended position.

[0076] 2. POSITIONING AND STABILIZING THE LOGFISHER

[0077] 2.1The operator of the 'Logfisher' moves into position (32) and prepares its staging point by clearing the site of wood debris, stumps and rocks which could in anyway interfere with its stability, especially when executing the winching operation.

[0078] 2.2 The Logfisher is aligned to its most commanding and stable position within the staging point, and close to the edge of the slope, but sufficiently setback to ensure the Logfisher is stable.

[0079] 2.3 Note that a single position of the Logfisher will be able to winch felled logs within the its arc of motion (rotation), which usually is the entire facing of the hill from where it is positioned. This increases productivity

and efficiencies as the Logfisher need not be repositioned as often.

[0080] 3 CLEARING THE STUMP SITE, NOOSING THE LOG AND CONNECTING THE WINCH

[0081] 3.1 The area around the felled tree will also be cleared of any obstruction, including vines and other vegetation which may hinder movement of workers. Safety precautions are taken to provide an escape route for the workers in case of eventualities.

[0082] 3.2 A Chain choker is placed around the circumference of the front end of the log, while field assistances bring in the cable.

[0083] 3.3. The cable is lowered by two or three assistants pulling the cable end down as they walk down to the site of the felled log. They pull with their body weight as they move down which enables the unwinding of the winch cable. They communicate by walkie-talkie with the stump site assistant.

[0084] 3.4 Upon reaching the felled log site, the end of the winch is hooked or fastened to the chain choker (or 'S'-Ring).

[0085] 4 EXECUTING THE WINCH

[0086] 4.1 Once the winch is secured to the choker, the supervisor instructs the Logfisher Operator by walkie-talkie to

tighten the winch. The purpose is to firstly gauge that the chain choker is sufficiently secured, and also to gauge the weight of the log to know how much pull force is required to be exerted by the Logfisher Operator.

[0087] 4.2 If the log is huge, and the weight considered is too heavy for the machine, this problem can be resolved by the assistants using a chainsaw to saw the log in half or other sizes and weight suitable weights for retrieval.

[0088] 4.3 Taking into account the gradient of the slope, the weight of the log, the Supervisor will know much exertion is required by the Logfisher. He will take into account any obstruction in the terrain that is encountered. Field assistants will accompany the log as it is winched up the slope, and check for any obstructions along the way, including standing trees, and to readjust the choker alignment if necessary, and communicate with the logfisher if there is a need to realign path of travel of the log.

[0089] 4.4 As the log nears the top, more force by the logfisher may be required as the trunk is set against the incline of the slope, and the operator of the Logfisher will increase power accordingly.

[0090] 5 TOP AND SHORT HAULING.

[0091] 5.1 At the top of the slope, the log normally rested on a

perpendicular log, while the chain choker is repositioned by assistants to the center of the length of the log, so that it is easier for Logfisher to pull and drag it. The Logfisher can reverse using its tracks, which will drag the log to its intended location.

[0092] 5.2 Another method by which the Logfisher performs short hauling winching, especially when a top of the log is jutting out from the slope and the rest of the log is still midway on the slope, is to apply a horizontal directional towing force by securing the log with a chain, and securing the other end of the Logfisher to the Forward Chain Carrier (7) . In this way, when the Logfisher moves backwards, the log is pulled up the slope due to the horizontal force applied through the chain. This allows for a more effective application of force to pull the log along in the horizontal place, which takes over the role of the more vertical force of the boom, when the log is to be hauled at short distances at the log assembly yard ground level.

[0093] 5.3 When sufficient logs have been retrieved to the collection zone, a timber lorry will arrive to carry the logs down to the next destination which is a log yard or mill.

[0094]